

Application No. 10/099,861
Docket No. DP-305031
Amendment dated January 22, 2004
Reply to Office Action of October 22, 2003

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1 (currently amended): A solder alloy consisting essentially of, by weight, at least 3.1% -3.0% to 3.5% silver, greater than ~~3%~~ -1% to about 15% copper, the balance tin and incidental impurities, the alloy having an effective melting range of about 215°C to about 222°C above which the alloy does not exhibit a mushy zone.

Claim 2 (original): A solder alloy according to claim 1, wherein the solder alloy has a solidus temperature in a range of about 215°C to about 218°C.

Claim 3 (original): A solder alloy according to claim 1, wherein the solder alloy has a liquidus temperature of about 290°C or more.

Claim 4 (currently amended): A solder alloy according to claim 1, wherein the copper content is at least 4 about ~~2~~ to about 10 weight percent of the alloy.

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Claim 5 (original): A solder alloy according to claim 1, wherein the copper content is greater than 4 weight percent of the alloy.

Claim 6 (original): A solder alloy according to claim 1, wherein the copper content is greater than 6 weight percent of the alloy.

Claim 7 (currently amended): A solder alloy according to claim 1, wherein the silver content is at least 3.2 ~~greater than 3.0 and less than 3.5~~ weight percent of the alloy.

Claim 8 (currently amended): A solder alloy according to claim 1, wherein the silver content is at least 3.3 ~~3.1 to 3.4~~ weight percent of the alloy.

Claim 9 (original): A solder alloy according to claim 1, wherein the solder alloy consists of, by weight, about 3.0% silver, about 15% copper, the balance tin and incidental impurities.

Claim 10 (original): A solder alloy according to claim 1, wherein the solder alloy consists of, by weight, about 3.1% silver, about 12% copper, the balance tin and incidental impurities.

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Claim 11 (original): A solder alloy according to claim 1, wherein the solder alloy consists of, by weight, about 3.2% silver, about 8% to about 10% copper, the balance tin and incidental impurities.

Claim 12 (original): A solder alloy according to claim 1, wherein the solder alloy consists of, by weight, about 3.3% silver, about 4% to about 6% copper, the balance tin and incidental impurities.

Claim 13 (currently amended): A solder alloy according to claim 1, wherein the solder alloy ~~contains~~ consists of, by weight, about 3.4% silver, ~~about 2% copper,~~
~~the balance tin and incidental impurities.~~

Claim 14 (original): A solder alloy according to claim 1, wherein the solder alloy is in the form of a solder bump on a surface-mount integrated circuit device.

Claim 15 (original): A solder alloy according to claim 1, wherein the solder alloy is in the form of a solder joint attaching a component to a laminate or ceramic substrate.

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Claim 16 (currently amended): A solder bump formed of an alloy consisting essentially of, by weight, 3.0% to 3.5% silver, greater than 3% ~~about 2%~~ to about 15% copper, the balance tin and incidental impurities, the alloy having a solidus temperature in a range of about 215°C to about 218°C, a liquidus temperature of at least 290°C, and an effective melting range of about 215°C to about 222°C above which the alloy does not exhibit a mushy zone.

Claim 17 (original): A solder bump according to claim 16, wherein the copper content is greater than 4 weight percent of the alloy.

Claim 18 (original): A solder bump according to claim 16, wherein the copper content is greater than 6 weight percent of the alloy.

Claim 19 (original): A solder bump according to claim 16, wherein the silver content is 3.1 to 3.4 weight percent of the alloy.

Claim 20 (currently amended): A solder bump according to claim 19, wherein the copper content is greater than 3% ~~about 2%~~ to about 10 weight percent of the alloy.

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Claim 21 (original): A solder bump according to claim 16, wherein the alloy consists of, by weight, about 3.0% silver, about 15% copper, the balance tin and incidental impurities.

Claim 22 (original): A solder bump according to claim 16, wherein the alloy consists of, by weight, about 3.1% silver, about 12% copper, the balance tin and incidental impurities.

Claim 23 (original): A solder bump according to claim 16, wherein the alloy consists of, by weight, about 3.2% silver, about 8% to about 10% copper, the balance tin and incidental impurities.

Claim 24 (original): A solder bump according to claim 16, wherein the alloy consists of, by weight, about 3.3% silver, about 4% to 6% copper, the balance tin and incidental impurities.

Claim 25 (currently amended): A solder bump according to claim 16, wherein the alloy contains consists of, by weight, about 3.4% silver ~~about 2% copper;~~ the balance tin and incidental impurities.

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Claim 26 (currently amended): A solder bump according to claim 16, wherein the silver content of the alloy is 3.3 to 3.4 weight percent of the alloy, ~~and the copper content of the alloy is 2.0 to 4.0 weight percent of the alloy.~~

Claim 27 (original): A solder bump according to claim 16, wherein the solder bump is on a surface-mount integrated circuit device.

Claim 28 (original): A solder bump according to claim 16, wherein the solder bump is in the form of a solder joint attaching a component to a laminate or ceramic substrate.

Claim 29 (currently amended): A solder reflow process performed with an alloy consisting essentially of, by weight, 3.0% to 3.5% silver, greater than ~~3%~~ ~~4%~~ to about 15% copper, the balance tin and incidental impurities, the process comprising the step of heating the alloy to a peak temperature of between about 240°C to about 260°C, at which the alloy reflows without exhibiting a mushy zone.

Claim 30 (original): A solder reflow process according to claim 29, wherein the solder alloy has a solidus temperature in a range of about 215°C to about 218°C.

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Claim 31 (original): A solder reflow process according to claim 29, wherein the solder alloy has a liquidus temperature of about 290°C or more.

Claim 32 (currently amended): A solder reflow process according to claim 29, wherein the copper content is greater than 3% about 2 to about 10 weight percent of the alloy.

Claim 33 (original): A solder reflow process according to claim 29, wherein the copper content is greater than 4 weight percent of the alloy.

Claim 34 (original): A solder reflow process according to claim 29, wherein the copper content is greater than 6 weight percent of the alloy.

Claim 35 (original): A solder reflow process according to claim 29, wherein the silver content is greater than 3.0 and less than 3.5 weight percent of the alloy.

Claim 36 (original): A solder reflow process according to claim 29, wherein the silver content is 3.1 to 3.4 weight percent of the alloy.

Claim 37 (original): A solder reflow process according to claim 29, wherein

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the solder alloy consists of, by weight, about 3.0% silver, about 15% copper, the balance tin and incidental impurities.

Claim 38 (original): A solder reflow process according to claim 29, wherein the solder alloy consists of, by weight, about 3.1% silver, about 12% copper, the balance tin and incidental impurities.

Claim 39 (original): A solder reflow process according to claim 29, wherein the solder alloy consists of, by weight, about 3.2% silver, about 8% to about 10% copper, the balance tin and incidental impurities.

Claim 40 (original): A solder reflow process according to claim 29, wherein the solder alloy consists of, by weight, about 3.3% silver, about 4% to about 6% copper, the balance tin and incidental impurities.

Claim 41 (currently amended): A solder reflow process according to claim 29, wherein the solder alloy contains consists of, by weight, about 3.4% silver, about 2% copper, the balance tin and incidental impurities.

Claim 42 (original): A solder reflow process according to claim 29, wherein

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the process causes the solder alloy to form a solder bump on a surface-mount integrated circuit device.

Claim 43 (original): A solder reflow process according to claim 29, wherein the process causes the solder alloy to form a solder joint attaching a component to a laminate or ceramic substrate.